“Prediction and analysis of medical images for early detection of Breast Cancer using deep learning”

For Degree of Philosophy in Computer Science

Under faculty of Science & Technology

Synopsis

Submitting to

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Abstract of proposed work:

Breast Cancer is the most common cancer diagnosed in women. Breast Cancer can occur in both men and women, but it is more common in women. Breast Cancer has ranked number one cancer among Indian females. 27.7% of all new cancers detected in women in India in the year 2018, were Breast Cancer. One woman is diagnosed with Breast Cancer, in India, every 4 minutes and one woman dies in every 8 minutes.

Early detection of this life-threatening disease not only increases the survival rate but also reduces the treatment cost. Deep Learning takes a significant role in handling and analyzing a great number of X-ray, MRI images. The most common technique that is used in research is Machine Learning. Machine learning algorithms like decision tree, KNN, SVM, etc. But now a days, a new developed technique is used to analysis the breast cancer. The new developed technique is deep learning. It extracts best features of the images. Deep learning methods have been demonstrated to be capable of diagnosing breast cancer up to 12 months earlier than those using conventional clinical procedures.

The aim of the study is to encourage field specialist (Radiologists or Pathologists) to use deep learning approaches for accurate as well as early detection and evaluation of Breast Cancer.n this study, we present the most recent breast cancer detection models that are deep learning based models by analyzing them in the comparative study.

Introduction:

Breast Cancer is most frequently occurring and harmful disease in the world. Cancer arises when the abnormal body's cell start to separate and come in contact with normal cells and make them malignant. On the basis of the spreading this disease, Breast Cancer considered either invasive or Non-invasive. Invasive is cancerous, malignant and spread in other organs. Non-invasive is pre-cancerous, remains in its original organ. Breast cancer spread to other organs frequently and make them malignant. Breast Cancer is the most prevalent cancer with high mortality and morbidity among women in the world. It is estimated that 6,85,000 women died due to Breast cancer in 2020.Cancer is the abnormal cell division due to which a mass is developed called tumor.

Accurate and precise diagnosis of breast cancer is vital for the timely detection of cancer to improve survability. In deep learning, many imaging modalities are continually being developed to diagnose this disease as early as possible. Medical images are the key source information for the recognition and diagnosis of cancer diseases. The currently used imaging modalities for the diagnosis of breast cancer are" Mammography" , "Ultrasound" , "Histopathology", "MRI", "CT", "Positron Emission Tomography",(PET) and Thermography.

Deep learning models have offered a good alternative to other conventional segmentation method, by automatically extracting deep high level hierarchy features for mass segmentation directly from input raw data to avoid the problems of hand-crafting features. A convolutional Neural Network (CNNs) consists of a number of convolutional layers which can extract features that represents the various contexts of images. That is why CNN has become the most widely used method for image interpretation tasks in many domains such as breast cancer detection and analysis.

In this study we analyze medical images using deep learning approaches for accurate and early detection and evaluation of breast cancer.

Aim and Objectives of study:

The aim of the study is earlier detection of Breast Cancer which can improve the survival rate of patients using deep learning methods.

objectives are given below:

- Study and analysis of medical images.
- Early detection of cancer disease.
- Implementation of algorithms for prediction and analysis of breast cancer using different deep learning classifiers.
- Study of growth stages of cancer disease.

Review of Literature:

This section gives the information about the related work of the research that has been already done. Basically two techniques are used to detect the breast cancer. First one is machine learning and second is deep learning. There are many researches that are conducted through the machine learning. But machine learning techniques have some problems that are removed through the deep learning. This section gives the information about machine and deep learning techniques.

Megha Rathi et al. [1] proposed the model based on hybrid approach using machine learning. It implemented this approach using MRMR feature selection with four classifiers to find out the best results. The author used the four classifier SVM, Naïve Bays, Function tree and End Meta and done the comparison between all. It found that SVM was a good classifier. To find out the better results, **M. Tahmooresi et al.**

[2] proposed the another hybrid model based on machine learning. According to that, SVM was a good classifier that gave the better accuracy among the all. It had done the comparison between SVM, KNN, ANN and decision tree. It implemented on the images and blood dataset. As the consequence, **Muhammet Fatih Aslan et al.**

[3] proposed the model on machine learning but used the different classifier. The classifier used by the author was Extreme Learning Machine, SVM, KNN and ANN. There was a bit change in classifier to find out the betterresults. According to that, Extreme Learning Machine gave the better results. **Anusha Bharat et al.**

[4] proposed the model based on machine learning. It used the four classifier like SVM, decision tree (CART), KNN, Naïve bayes. According to author, KNN gave the better accuracy. There was limitation in SVM. SVM gave the better results for binary variables. So that's why Multi-SVM was used. **Ebru Ayndindag Bayrak et al.**

[5] done the comparison on machine learning techniques. The comparison was implemented on the WEKA and dataset was Wisconsin breast cancer dataset. According to author, SVM showed the better results in performance matrices. After the machine learning, deep learning techniques were developed to solve the problem of machine learning.
Shewtha K et al.
[6] proposed the model on deep learning based convolution neural network. There were many models that came under the CNN but the used Mobile Net and Inception V3. The author had done the comparison on both models and found Inception V3 gave the better Accuracy. But there was a still chance to use machine learning for breast cancer. **Ch. Shravya et al.**

[7] proposed the model on supervised machine learning. This research was implemented on classifier like Logistic Regression, SVM and KNN. The dataset was downloaded from UCI repository and results were conducted with respect to performance. According to this, SVM was a good classifier that gave 92.7% accuracy on python platform. **Sivapriya J et al.**

[8] proposed the model on machine learning but on different classifier. The author used the Random Forest, SVM, Logistic Regression and Naïve bays. The implantation was done on Anaconda Platform for python. The author found Random Forest was a good classifier in terms of performance and gave 99.76% accuracy. When there was some bit change in network with classifier then there was a possibility toimprove the accuracy. In this paper, **Kalyani Wadkar et al.**

[9] proposed the model based on ANNand performance was analyzed by SVM classifier. According to author, ANN gave 97% accuracy and SVM 91%. The author also told without SVM, it gave the better accuracy. **Vishal Deshwal et al.**

[10] proposed the model based SVM and Grid search. The author implemented the research firston SVM and then SVM with Grid search. The author done the comparison and find out the best one. According to comparison, the new model was built. The better accuracy was achieved with grid search. **S. Shamy et al.**

[11] proposed the model based on k-mean GMM and CNN. The author first find out ROI and then applied the texture feature extraction method. At last, He applied the CNN algorithm to find out the better results. The accuracy achieved by the author was 95.8%. The MIAS dataset used by the author. **V Sansya Vijayam et al.**

[12] proposed the model based on deep learning . The author focused on Lloyd's algorithm for clustering and CNN for classification. The 96% accuracy was achieved by the proposed methods. It used the histopathology images forthe diagnosis purpose. This paper also explained the image processing and deep learning. **Puspanjali Mohapatra et al.**

Methodology to be adopted:

In this analytical study , the database was obtained from a clinical cancer research center.Rapid development in deep learning has made the task of detecting cancerous cells accurate and trival. Deep learning analysis of radiological images has the potential to improve diagnostic accuracy of breast cancer, ultimately leading to better patient outcomes.

A machine learning (ML) algorithm helps lot to take decisions and to perform diagnosis from the data collected by medical field. Various researches show that ML techniques are helpful for decision making in breast cancer prediction.

In recent times, different deep learning based methods have been introduced for breast cancer diagnosis, which include CNN, DNN, RNN, DBN, and AE based approaches. CNN that is Convolutional Neural Network is the most popular deep-learning technique that has been utilized in several studies for breast cancer detection.

Using different medical images, research is done in the area for various datasets on breast cancer. Medical images are the key source information for the recognition and diagnosis of cancer diseases. In deep learning, many imaging modalities are continually being developed to diagnose this disease as early as possible.

Comparative study to check which algorithm work better in this field of study and also to develop new algorithm based model using programming language like python, Matlab.

Scope and Significance of the study:

Deep learning techniques can give better accuracy when data is complex and large compared to machine learning algorithms. Research is being done in the area for various datasets on breast cancer. There are many deep learning techniques available for cancer detection and prediction.
Breast cancer occurs in every country in the world in women at any age after puberty but increasing rates in late life. As the end of 2020, There were 7.8million women alive who were diagnosed with breast cancer in the past 5 years, making it the world's most prevalent cancer.
Earlier prediction of breast cancer can improve survival rate of patients. Fortunately advancements in medical imaging techniques have made it possible to diagnose breast cancer at earlystage, Early detection of Breast Cancer considerably increases the likelihood of making better treatment decisions.

Proposed work Plan/ Formulation and Structure of Study:

Year-wise Plan of work and targets to be achieved:

2022-2023:

- Collection of Research Papers
- Complete Course Work.
- Study of different Deep learning classifiers.
- Participate Seminar/Conferences/Training Related Subject.

2023-2024:

- Manually database will be created.
- Collection of Research Papers.
- Two or Three Research Papers published.

2024-2025:

- Study of AI, Deep learning algorithms.
- Feature extraction techniques implemented in software.
- Two or Three Research Papers published.

2024-2025:

- Study of Deep learning techniques.
- Feature extraction techniques implemented in software.
- Algorithms are developed.
- Algorithm is Tested different Circumstances.
- Two or Three Research papers published

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